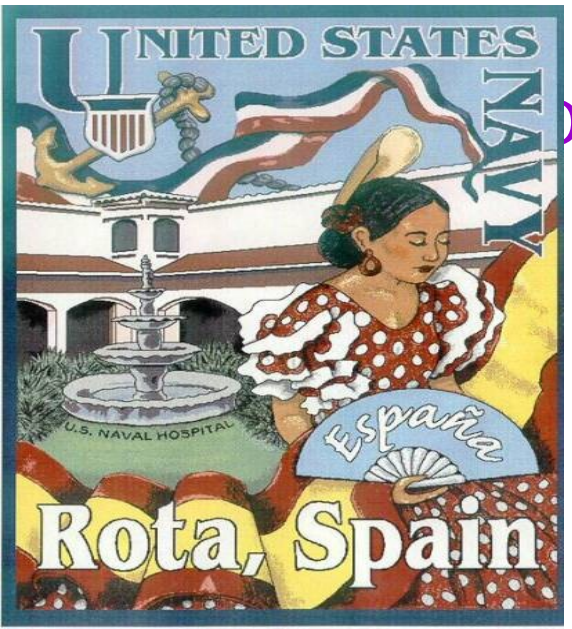
ERGONOMIC IMPROVEMENT PROJECTS ONGOING AT U.S. NAVAL STATION, ROTA SPAIN

2003 European Net Tri-Service
Occupational Health & Safety Workshop

Ramstein Air Base Germany



by

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OBJECTIVE(S) OF BRIEF

- Case Studies of Some Ergo-Issues at NAVSTA Rota Spain
- Analytical Tools Used to Evaluate Ergonomic Stress / Injury Hazard Potentials.
- Special Navy Facilities Command (NAVFAC) Funding Program for Abating Safety & Health Hazards Beyond Resources of Local Base

CASE STUDY 1: Small Ammunition Box Handling

Task One: Worker climbs up on pallet to access ammunition

Concern: Risk of shoulder injury or fall

Recommendation: Provide appropriate ladder, training and supervisory policy to assure proper use

Task Two: Worker selects ammunition box (~ 60 lb. weight)

Concern: Risk of twisting injury and / or falling

CASE STUDY 1: Small Ammunition Box Handling

Task Three: Worker fully squats with ammunition box

Concern: Deep squat lifting places excessive stress on the spine and expends a great deal of energy resulting in routine fatigue

Recommendation: FREQUENTLY rotate personnel

Task Four: Worker lifts ammunition box

Concern: Minor, as lift is performed within “neutral” body zone between knees and shoulders

CASE STUDY 1: Small Ammunition Box Handling

Task Five: Workers places ammo box on dolly

Concern: *Deep squat lifting places excessive stress on the spine and expends a great deal of energy resulting in routine fatigue.*

Task Six: Ammunition is wheeled to truck

Concern: The dolly weighs 375 pounds when fully loaded with six ammo boxes (~ 60 lb. each. *This poses spinal strain/ injury potential.*

NOTE: Poses accidental drop potential of live ammo.

CASE STUDY 1: Small Ammunition Box

Task Seven: Worker performs yet ANOTHER **full** lift of same ammunition box from dolly to pick-up truck.

Concern: Deep squat lifting places excessive stress on the spine while expending a great deal of energy producing routine fatigue / muscle soreness.

Task Eight: Worker passes on ammunition box to co-worker.

Concern: Back is especially vulnerable to injury during twisting motions with heavy loads.

CASE STUDY 1: Small Ammunition Box Handling

- **Task Nine:** Worker carries ammunition box to front of truck.

- **Task Ten:** Workers places box in truck.

Concerns: The same ~60 lb ammo box has been lifted Up and Down ***a total of six times*** in its 50 foot travel distance to delivery truck.

Boxes must then all be UN-loaded at NAVSTA Rota Pier for the ship's crew to "hump-up" to the ship's ammo storage area.

- NOTE: For female workers the 60 Lb. Ammo box may be more than 50% of their total body weight !!

CASE STUDY 1: Weapon Handlers "JR / PD"

Analysis

1. "JOB REQUIREMENTS and PHYSICAL DEMANDS *("JRPD")* Surveys distributed to Rota Weapons handlers in December 2001.
   --100% survey completion response obtained for Rota's 17 weapons handlers

2. Submitted to Navy Ergonomists Theresa Stack and Mindy Smith --under contract to Naval Facilities Command (NAVFAC)--for scanning & statistical risk analysis.

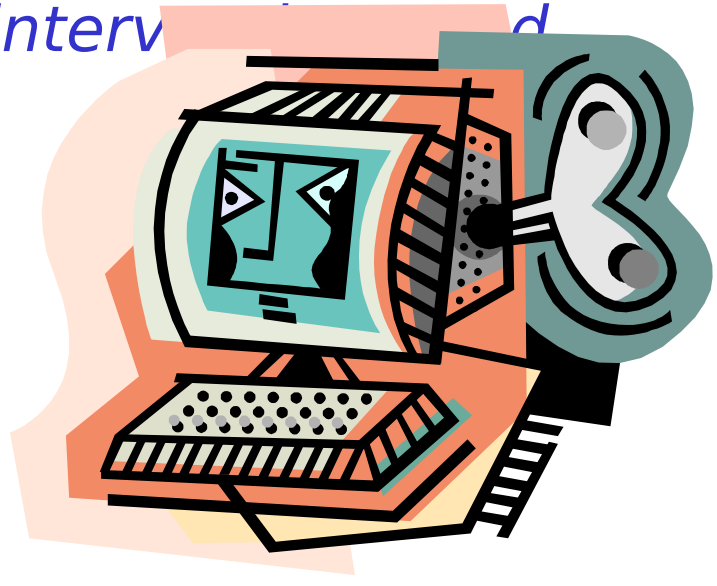
CASE STUDY 1: Weapon Handlers "JR / PD" Results

- NAVFAC Ergonomists' Analysis of Rota JRPD forms concluded:

"*that the weapons handling task is an "Ergonomic Problem Area" (ERPA). The process scored an Overall Priority Ranking of SEVEN (on a scale of 1 to 9), where:*

-- 9.0 has the highest priority for interv[illegible]d

> 5.0 is an ERPA."



CASE STUDY 1: **Recommendations**

Provide a Heavy Duty ergonomically designed carts to the Weapons Division and many other installation departments where risk of back injury significant from Manual Material Movement:

--Food Service Galley

--Main Supply Warehouse

--Hazardous material Center (55 gallon drum caddies)

IMMEDIATE BENEFITS OF ERGONOMIC CART PROCUREMENT

1. Use of such mechanical assists BASEWID will minimize lifting from floor level to above the knee.

2. In the case of ammo box handling, eliminates TWO lifts per box PER movement cycle from pallet to pick-up truck (i.e., task numbers five and seven). Having a similar cart staged at the NAVSTA Rota Port could save additional lifts during un-loading.

3. **Justification:** ONE back injury (i.e., muscular strain, herniated discs, etc.) can cost $27,000 PLUS lost productivity while injured member recovers.

4. **Return on Ergonomic Investment (ROI) =** $\frac{\text{\$27 K minimum Back Injury Cost}}{\text{\$12K for Base's ergo-cart assortment}}$ **= 225 %**

CASE STUDY 1: Current Status of Material Handling Cart Upgrade Project Abatement Funding Request

- Special Funding request for $12K submitted to Navy's Occupational Safety & Health Hazard Abatement Funding Panel ("The Murder Board") in February 2002 **APPROVED**

CASE STUDY 1: Ammunition Box Design Issues

Task : Manual movement of ammunition boxes to truck

Concern(s): Thin, bare metal handles of largest ammo box are VERY poor in terms of ergonomic design. Large ammo boxes contain 1500, 7.62mm rounds--weighing 120 pounds.

1) NO padding or softer surfaces (i.e., wood) have been designed into ammo container handle design.

2) Such direct contact stress on very sensitive interior hand zone represents special risk to exposed tendons, nerves & blood vessels.

3) “Small” 60 lb. ammo crates have no handles at all.

CASE STUDY 1: Ammunition Box Design Issues

Concern #3: Gloves currently in use have leather seam DIRECTLY in area of handle contact with hand, thus causing MORE contact / pressure stress & ultimate discomfort / injury potential to personnel

RECOMMENDATIONS:

* Replace gloves with similar leather ones WITHOUT a seam in the hand / palm area. Additional padding would also a plus.

* Attempt to pad the metal handles with industrial foam rubber covers for extra cushioning.

Naval Hospital Rota has contacted the Navy NAVFAC Ergonomics consultant to see if the design specification of these ammo boxes can be modified to include a thicker, softer handle (i.e., wood dowel) that will facilitate “Power-Grips” by weapons personnel

CASE STUDY 2: P-3 AIRCRAFT

-- On this aircraft, you have a population of 24 active duty personnel working in static seated postures for up to 16 hours per mission.

--EP3 aircraft seating was initially identified as an potential ergonomic problem area by the Industrial Hygiene office at

--NAVFAC Ergonomists obtained clearance to enter actual EP-3 at NAS Whidbey Island, Oak Harbor, WA for detailed field study.

--JRPD Ergo-stress survey issued to Rota EP-3 flight crews

CASE STUDY 2: P-3 AIRCRAFT

An on-site evaluation by NAVFAC Ergonomic function uncovered additional environmental factors as areas of further study:

- Continuous Noise
- Vibration
- COLD rear operations area temperatures
- Awkward reaches for equipment controls
- Lack of self-contained toilet facility

CASE STUDY 2: P-3 AIRCRAFT RISK ASSESSMENT FINDINGS

JRPD Ergo-stress survey analysis by NAVFAC Ergonomic function findings included:

--Overall Ergo-intervention Priority Score = 8 (HIGH)

Note: > 5 considered "significant"

<u>Ergonomic Issues Identified in P-3 Working Environment</u>

--Leg/foot region had 63% respondent discomfort prevalence

--Hand / arm / wrist region had 50% respondent discomfort prevalence

--Aircrew seat pans TOO long for many smaller operators to receive adequate back support.

--Seat cushions often deformed / compressed

CASE STUDY 2: P-3 AIRCRAFT RISK ASSESSMENT FINDINGS

P-3 Ergonomic Issues, Con't. :

--Awkward bent neck postures

--Working with hands/arms above chest level

--Performing nearly-continuous repetitive tasks

--Working in a vibrating environment

--Standing on hard surfaces

--Glare on equipment screens

--Difficulty concentrating due to engine noise

--Mental fatigue from constantly scanning monitors

CASE STUDY 2: P-3 AIRCRAFT ERGONOMIC RECOMMENDATIONS

- CDR Don Hagen, at CNO N45 is working to address issues with Naval Air Systems Command

--Increase frequency of crew seat inspection, maintenance & repair.

--Investigate possibility of electrically-heated body suits.

--Implement obligatory air crew stretching breaks.

--Investigate possible installation of acoustical barriers

--Re-orient monitoring equipment to minimize awkward operator postures (e.g., arm reaches, bent necks, etc.)

CASE STUDY 3: OPERATING ROOMS

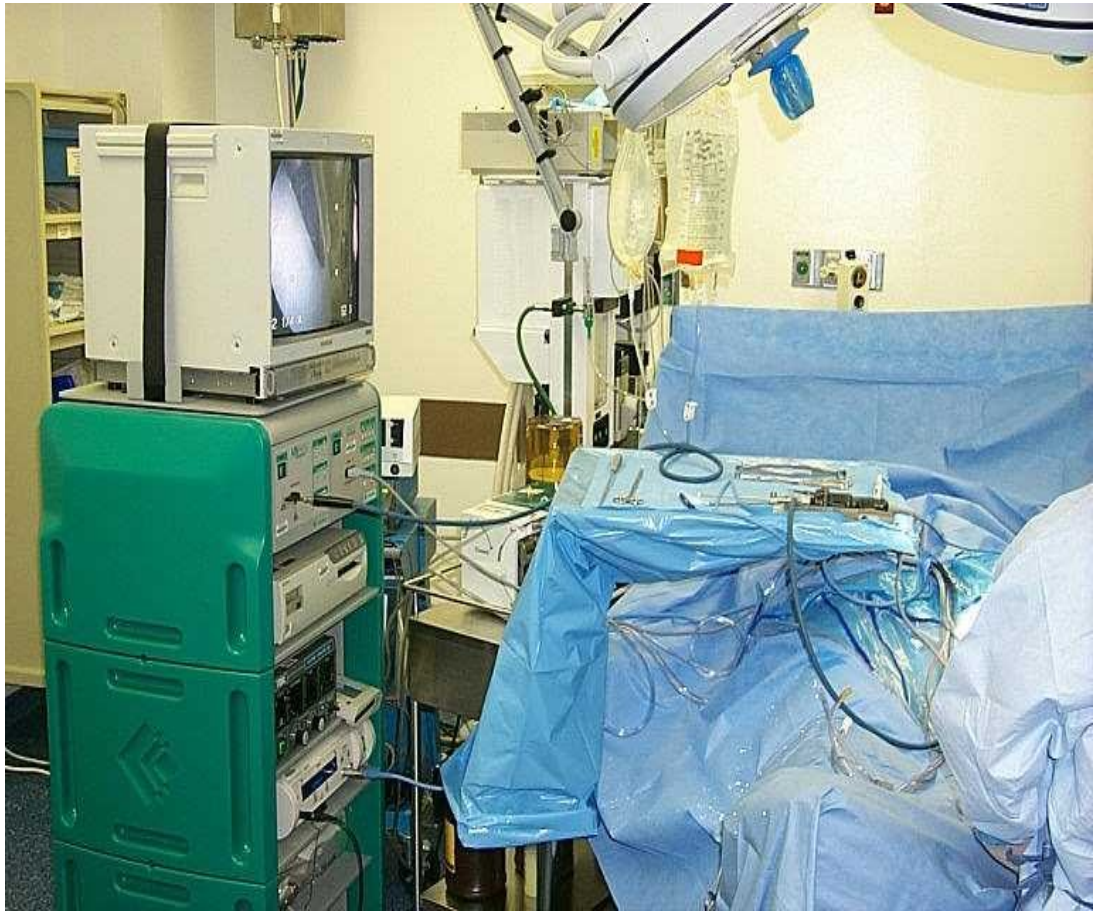
- NH Rota operating suites meet architectural standard of approximately 20 x 20 ft (400 sq. feet usable floor space).

CASE STUDY 3: OPERATING ROOMS

- Although total calculated floor space occupied by surgical equipment and staff was approximately 81 sq. feet (20% of the total OR), the vast majority of staff & equipment are (naturally) centered around the operating table & surgeon.

CASE STUDY 3: OPERATING ROOMS

- **Observation #1**: Access to the video endoscopy system (VES) camera / monitor cart was severely obstructed by other necessary orthopedic surgical gear (i.e., arthroscopy liquid pump and operating table itself).

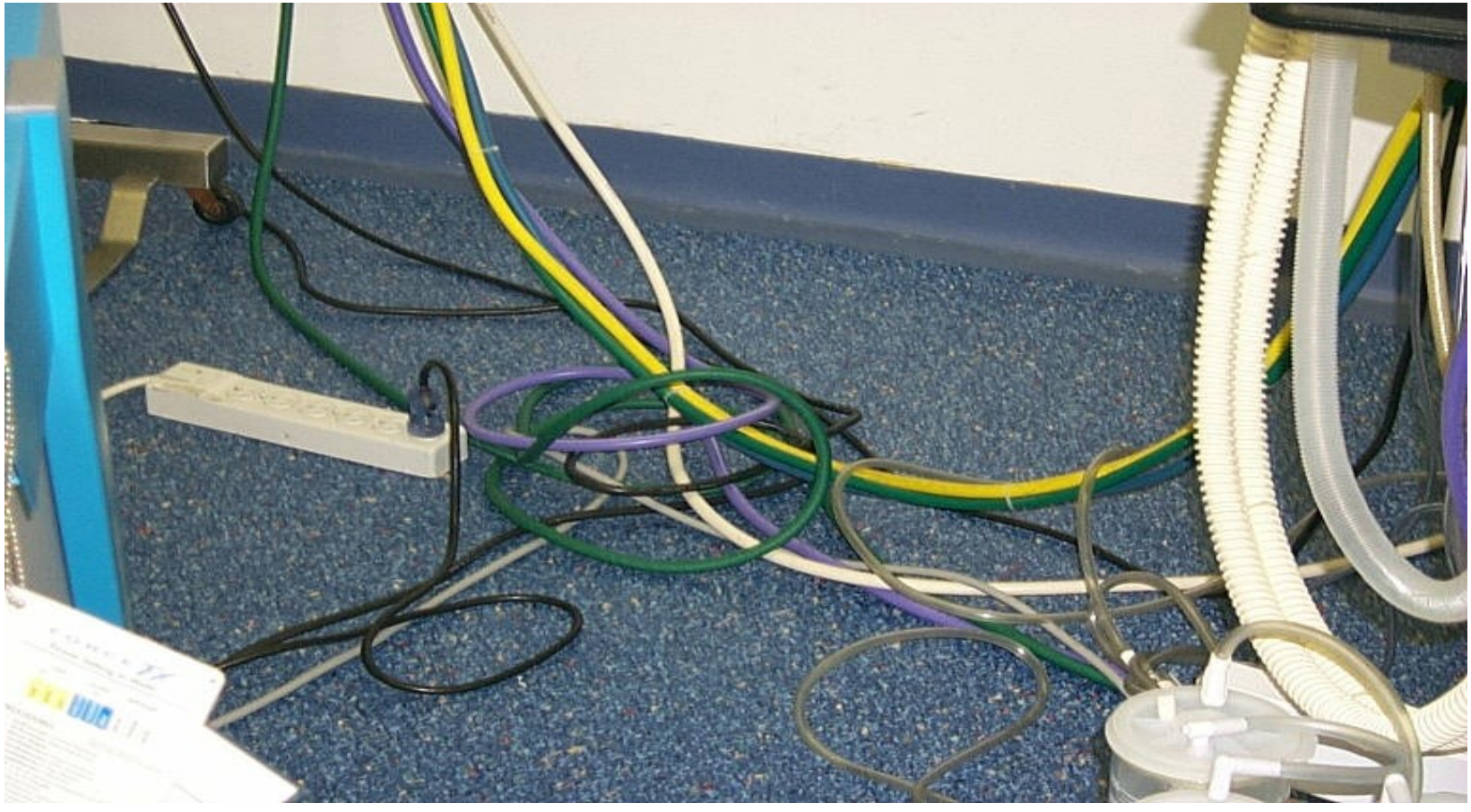


CASE STUDY 3: OPERATING ROOMS

- **Observation #2:** The equipment cart used for preparing a section of knee ligament / tendon to be re-attached has a fixed (LOW) height and welded bottom shelf which preclude staff working on it in a seated posture (i.e., no room fo legs when a stool was offered hi

CASE STUDY 3: OPERATING ROOMS

- **Observation #3:** Medical lines and electrical cable management needs drastic improvement .



CASE STUDY 3: OPERATING ROOMS

- **Observation # 4:** Advent of “VES” technology has dictated surgeon's adopt a standing posture with a very static / essentially immobile posture –
- Surgeons may need to maintain for up to 6 hours (or possibly more in complicated orthopedic restoration cases).
- At Naval Hospital, Rota more than 50% of all surgical procedures are utilizing VES technology

CASE STUDY 3: OPERATING ROOMS RE-DESIGN RECOMMENDATIONS

As part of Navy Bureau of Medicine & Surgery (BUMED) Ergonomics Excellence Program, the following OR Design Changes are being Explored:

- "Nitrile" Ergo-floor matting around OR tables
- Raising "VES" video cart gear off OR floor via rack / shelf mounting (Low profile flat panel screens)
- OR Techs now section tissue in seated postures
- Better cable management via ceiling "drop-lines"
- "Lean / sit " stools for surgeons

ERGO-TEAM PROPOSAL: NAVAL HOSPITAL ROTA VISION FOR THE 21st CENTURY BUMED OPERATING SUITE

ROTA VISION FOR THE 21st CENTURY BUMED OR: VES PROCEDURES

•R3S Surgeon Power Equipment Mini-Carrier Skyboom & Separate Flat screen Monitor Mount (with Skytron Surgical Lights)

•R3S Mini-Carrier with Adjustable Shelves for Equipment (Shaver, ESU and SkyVac Smoke Evacuator, etc.) .Nitrogen System for Saws and Power Tools

•15’ Reach, 360 Degree Positioning Around Entire Periphery of Patient

ROTA VISION FOR THE 21st CENTURY BUMED OR: ANESTHESIA DELIVERY

- Delivers medical gas, electrical, and communications services with a reach of 80 inches to key target areas
- Portable Tether Bar allows for convenient attachment /detachment to Anesthesia Machine
- Provides anesthesia the ability to quickly reposition the Anesthesia Machine (and services) to new target areas-- while keeping medical gas hoses, electrical and communications connections intact

ROTA VISION FOR THE 21st CENTURY BUMED OR: MEDICAL LINE MANAGEMENT

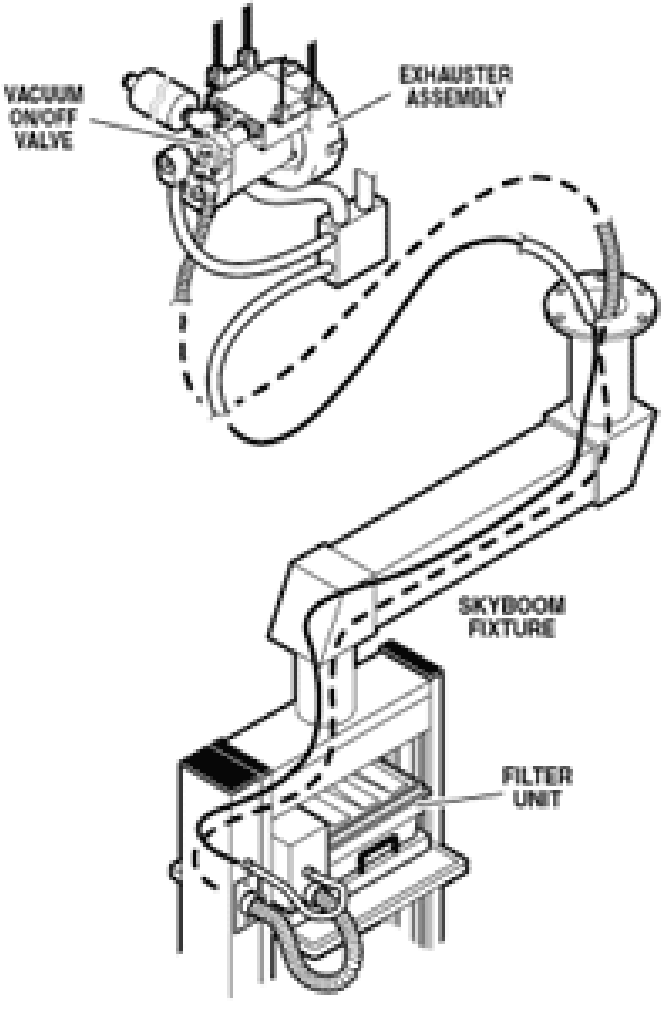
- Delivers medical gas, electrical, and communications services

- Provides a reach of 90 inches to key target areas

- Available in fixed, manual or power height adjustment

- Powered Height adjustable system features tethered remote hand control for convenient up/down operation

CASE STUDY 3: ROTA VISION FOR THE 21st CENTURY BUMED OR: TISSUE SMOKE MANAGEMENT



- **Designed to capture and remove potentially harmful laser and electro-surgical surgical smoke.**
- One hundred (100) hour filters provide filtration for up to 400 surgical cases at the rate of 0.01 microns at 99.99995% efficiency.
- Eliminates odors and contamination typically generated by surgical plume, while also **greatly improving vision at the surgical site**.

CASE STUDY 3: ROTA VISION FOR THE 21st CENTURY BUMED OR: SPECIALTY SURGEON ERGONOMIC SEATING

Advantage Surgeon's Chair gives surgeons:

--Wraparound adjustable body support and a tilting seat to properly position and support the body in a forward-leaning position.

--Cushioned seat tilts forward to restore natural curve of the lumbar spine and prevent excess pressure on the underside of the thighs.

--Degree of tilt can be adjusted and set to surgeon preference with manual crank tilt adjustment.

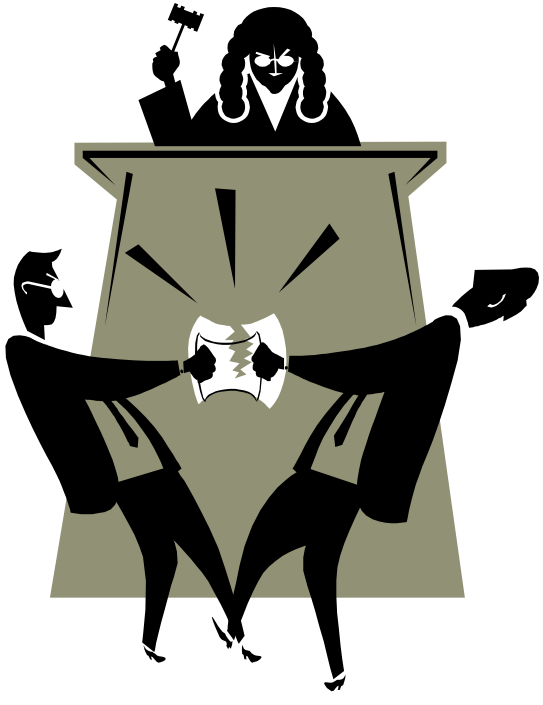
--Optional Adjustable Wrist Rest is

CASE STUDY 3: Current Status of 21st Century Operating Room Renovation Project

- Special Funding request for $150K submitted to Navy's Occupational Safety & Health Hazard Abatement Funding Panel ("The Murder Board") in February 2003 **APPROVED**

- **OR Suite renovation projected for Spring 2004**

- Once operational, Rota's OR will be offered to other Navy / DoD Ergonomists & Healthcare specialists to study & trial-test as possible new *"Standard-of-Care"* construction criteria specification.



CASE STUDY 4: Wire Crane Rope Cleaning

- Cleaning and lubrication of wire ropes at Naval Station Rota's Public Works Transportation division is a 100% manual task posing numerous ergonomic risks to our people.

CASE STUDY 4: Wire Crane Rope Cleaning

Concern: ***C****rane riggers forced to maintain awkward postures for long periods while continually standing (e.g., bending and twisting their torsos, wrists, arms, and necks) while using repetitive motions to clean and lubricate the approximately 2,650 feet of wire rope per crane.*

CASE STUDY 4: Wire Crane Rope Cleaning

- **Proposed Solution**: Automated wire crane cable cleaning system to eliminate ergonomically hazardous manual work aspect of this monotonous task.

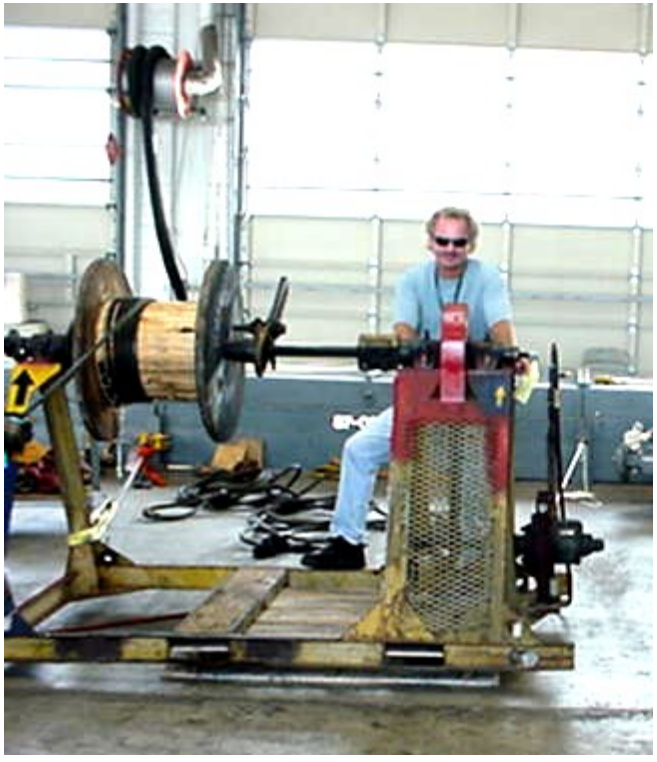
Inside view of lubrication collar, the point where wire rope runs through the automated wire rope lubrication system (PWC San Diego photo)

The automated system cleans and lubricates wire rope at a rate of 100 feet per minute -- ***as compared to the manual rate of approximately one foot per minute. !!!***

CASE STUDY 4: Wire Crane Rope Cleaning

- **Proposed Solution**: **Cleaning and lubricating wire ropes on cranes using the old manual method took approximately five eight-hour workdays per crane. Using the automated system, wire rope on a crane can now be cleaned and lubricated in one eight-hour day.**

Crane riggers place the end of a wire rope into the automatic cleaning and lubrication system (PWC San Diego photo)



While comfortably seated, a rigger mans a winch to ensure wire rope winds evenly onto storage spool (PWC San Diego photo)

CASE STUDY 4: Wire Crane Rope Cleaning System Cost-Benefit Analysis

Total cost to outfit Rota Crane Shops = **$7500**

- **Return on Investment (ROI):** The automated lubrication system has reduced PWC San Diego's annual cost of cleaning cables from about $320,000 a year to approximately $34,000, **a yearly savings of approximately $286,000.** ***ROI ratio calculated to equal 9.4!***

- **Rota Crane System Status**: $20K funding project bid to Naval Facilities Command (NAVFAC) Safety Deficiency abatement funding program **APPROVED** in March 2003 !

Acknowledgements

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